

SEQUENCE LISTING

<110> BASF Aktiengesellschaft

<120> GMP synthetase from plants

<130> DE 19947490.7

<140> 0050-50777

<141> 1999-10-01

<160> 4

<170> PatentIn Vers. 2.0

<210> 1

<211> 1973

<212> DNA

<213> Nicotiana tabacum

<220>

<221> CDS

<222> (65)..(1678)

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Met Glu Pro Gln Thr Gln Ala Lys Ser Asn Leu Val Leu Ile
1 5 10 15

cta gac tac ggt tct cag tac act cac cta atc acc cgc cga atc cga 157
Leu Asp Tyr Gly Ser Gln Tyr Thr His Leu Ile Thr Arg Arg Ile Arg
20 25 30

agc cta tca att ttc tca ctc acc att aac ggc acc tct tcg tta gac 205
Ser Leu Ser Ile Phe Ser Leu Thr Ile Asn Gly Thr Ser Ser Leu Asp
35 40 45

tcc ata aaa gaa ctc gac cca cgt gtc att atc ctc tcg ggt gga ccc 253
Ser Ile Lys Glu Leu Asp Pro Arg Val Ile Ile Leu Ser Gly Gly Pro
50 55 60

cac agc gtc cac gct gac ggc gca ccg tgt ttc cca cct ggg ttc atc 301
His Ser Val His Ala Asp Gly Ala Pro Cys Phe Pro Pro Gly Phe Ile
65 70 75

gaa tac gtc gag tca cgt ggg att cac gtg ttg ggt ata tgt tat ggg 349
Glu Tyr Val Glu Ser Arg Gly Ile His Val Leu Gly Ile Cys Tyr Gly
80 85 90 95

ctg cag ttg att gtt cag aaa ctt ggc ggg gtt gtg aaa att gga gag 397
Leu Gln Leu Ile Val Gln Lys Leu Gly Gly Val Val Lys Ile Gly Glu
100 105 110

aaa cat gag tat ggg aga atg gaa att gag gtt gga aag aat gtt gtt 445
Lys His Glu Tyr Gly Arg Met Glu Ile Glu Val Gly Lys Asn Val Val

115	120	125	
ggg ggg ttg ttt ggg aat acg gaa att ggt gat aaa cag gtg gtt tgg Gly Gly Leu Phe Gly Asn Thr Glu Ile Gly Asp Lys Gln Val Val Trp 130	135	140	493
atg agc cac ggt gat gag gct gtg aaa ttg ccg gaa ggg ttt gag gtt Met Ser His Gly Asp Glu Ala Val Lys Leu Pro Glu Gly Phe Glu Val 145	150	155	541
gtg gcg agg agt agt gag ggt gct gtt gct att gag aat cgg gaa Val Ala Arg Ser Ser Gln Gly Ala Val Ala Ile Glu Asn Arg Glu 160	165	170	589
cgg agg ttt tat ggg ctg cag tat cat ccc gag gta acg cac tcg act Arg Arg Phe Tyr Gly Leu Gln Tyr His Pro Glu Val Thr His Ser Thr 180	185	190	637
gaa ggg atg aga aca tta aga cac ttt ctg ttt gat gta tgt ggc gtt Glu Gly Met Arg Thr Leu Arg His Phe Leu Phe Asp Val Cys Gly Val 195	200	205	685
aca gct ggc tgg aag atg gaa gat gtt ctg gag gaa gaa ata aaa gtt Thr Ala Gly Trp Lys Met Glu Asp Val Leu Glu Glu Ile Lys Val 210	215	220	733
atc aaa ggt atg gtt gga cct gaa gat cac gtg att tgt gct tta tct Ile Lys Gly Met Val Gly Pro Glu Asp His Val Ile Cys Ala Leu Ser 225	230	235	781
ggg ggt gtt gat tcc aca gtt gca gct aaa ttg gta cac aag gct atc Gly Gly Val Asp Ser Thr Val Ala Ala Lys Leu Val His Lys Ala Ile 240	245	250	829
ggg gac agg ctt cac tgt gtt ttt gtt gat aat ggt cta tta agg tat Gly Asp Arg Leu His Cys Val Phe Val Asp Asn Gly Leu Leu Arg Tyr 260	265	270	877
aag gag aga gaa agg gtg atg gaa ctc ttt gag aag cgc ctt cat ttg Lys Glu Arg Glu Arg Val Met Glu Leu Phe Glu Lys Arg Leu His Leu 275	280	285	925
cct gtt acc tgt gtc gat gct aca gaa ttt ctc agc aaa cta aaa Pro Val Thr Cys Val Asp Ala Thr Glu Phe Leu Ser Lys Leu Lys 290	295	300	973
ggc gta aca gaa cct gaa atg aag agg aaa ata att ggg aag gag ttc Gly Val Thr Glu Pro Glu Met Lys Arg Lys Ile Ile Gly Lys Glu Phe 305	310	315	1021
atc aac ata ttt gat ctt ttt gcc cat gat gtg gag gaa aaa gta ggg Ile Asn Ile Phe Asp Leu Phe Ala His Asp Val Glu Glu Lys Val Gly 320	325	330	1069
aaa aaa cct agt tac cta gtc caa gga acc ttg tat cct gat gta ata Lys Lys Pro Ser Tyr Leu Val Gln Gly Thr Leu Tyr Pro Asp Val Ile 340	345	350	1117

gag tct tgt cct cca cct gga agt gga aga aca cat tct cat aca atc Glu Ser Cys Pro Pro Pro Gly Ser Gly Arg Thr His Ser His Thr Ile 355 360 365	1165
aag agc cat cat aat gtt gga ggt ctt cca aag gac atg aag ctg aag Lys Ser His His Asn Val Gly Gly Leu Pro Lys Asp Met Lys Leu Lys 370 375 380	1213
ctc atc gag cca ctg aaa ctt cta ttc aag gat gag gtt cgt gaa ttg Leu Ile Glu Pro Leu Lys Leu Leu Phe Lys Asp Glu Val Arg Glu Leu 385 390 395	1261
gga aag att ttg gat ata tct gag gac ttt ctt aaa cgc cac ccc ttc Gly Lys Ile Leu Asp Ile Ser Glu Asp Phe Leu Lys Arg His Pro Phe 400 405 410 415	1309
cct ggg ccc gga ctc gct gtg cga att cca ggt gat gtc aca gca ggg Pro Gly Pro Gly Leu Ala Val Arg Ile Pro Gly Asp Val Thr Ala Gly 420 425 430	1357
aat tcc ttg gat att ctt cgt cag gtt gat gaa atc ttc att caa tca Asn Ser Leu Asp Ile Leu Arg Gln Val Asp Glu Ile Phe Ile Gln Ser 435 440 445	1405
atc aga gat gct aaa atc tat gat gaa ata tgg caa gct ttt gct gtc Ile Arg Asp Ala Lys Ile Tyr Asp Glu Ile Trp Gln Ala Phe Ala Val 450 455 460	1453
ttc tta cca gtg aaa act gtt gga gta caa gga gac caa aga acc cat Phe Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp Gln Arg Thr His 465 470 475	1501
tcc cac gct gtt gca ctt ata gca gtc aca agt caa gat gga atg act Ser His Ala Val Ala Leu Arg Ala Val Thr Ser Gln Asp Gly Met Thr 480 485 490 495	1549
gca gac tgg tac tac ttt gat ttc aag ttc ctt gac gac gta tca aga Ala Asp Trp Tyr Tyr Phe Asp Phe Lys Phe Leu Asp Asp Val Ser Arg 500 505 510	1597
aag atc tgc aat agt gtt cgt ggt gta aat cga gtt ctg ctg gat att Lys Ile Cys Asn Ser Val Arg Gly Val Asn Arg Val Leu Leu Asp Ile 515 520 525	1645
aca tca aag cct cca tca aca atc gaa tgg gaa taatttgtta taaaatgtc Thr Ser Lys Pro Pro Ser Thr Ile Glu Trp Glu	1698
530 535	
tatatatttgtt gaccaaagta ggattttttt gtgtatttttt gtgcataaca aaaaggaaga	1758
aaatcataat agaaaatttag gtccttttgt tatgtgttag aactggttct tggtaattta	1818
tgtgcataatgc tctcaacaat ttgttatgtt tatgggtatg atgatacaat attttactca	1878
gatcttggta gtacatctttt ctatccaag tatagtaaca tggtggcagg catcaaaaagc	1938

ctattccact caaaaaaaaaaa aaaaaaaaaac tcgag

1973

<210> 2
<211> 538
<212> PRT
<213> Nicotiana tabacum

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Leu Ser Ile Phe Ser Leu Thr Ile Asn Gly Thr Ser Ser Leu Asp Ser
35 40 45
Ile Lys Glu Leu Asp Pro Arg Val Ile Ile Leu Ser Gly Gly Pro His
50 55 60
Ser Val His Ala Asp Gly Ala Pro Cys Phe Pro Pro Gly Phe Ile Glu
65 70 75 80
Tyr Val Glu Ser Arg Gly Ile His Val Leu Gly Ile Cys Tyr Gly Leu
85 90 95
Gln Leu Ile Val Gln Lys Leu Gly Gly Val Val Lys Ile Gly Glu Lys
100 105 110
His Glu Tyr Gly Arg Met Glu Ile Glu Val Gly Lys Asn Val Val Gly
115 120 125
Gly Leu Phe Gly Asn Thr Glu Ile Gly Asp Lys Gln Val Val Trp Met
130 135 140
Ser His Gly Asp Glu Ala Val Lys Leu Pro Glu Gly Phe Glu Val Val
145 150 155 160
Ala Arg Ser Ser Gln Gly Ala Val Ala Ala Ile Glu Asn Arg Glu Arg
165 170 175
Arg Phe Tyr Gly Leu Gln Tyr His Pro Glu Val Thr His Ser Thr Glu
180 185 190
Gly Met Arg Thr Leu Arg His Phe Leu Phe Asp Val Cys Gly Val Thr
195 200 205
Ala Gly Trp Lys Met Glu Asp Val Leu Glu Glu Ile Lys Val Ile
210 215 220
Lys Gly Met Val Gly Pro Glu Asp His Val Ile Cys Ala Leu Ser Gly
225 230 235 240
Gly Val Asp Ser Thr Val Ala Ala Lys Leu Val His Lys Ala Ile Gly
245 250 255

Asp Arg Leu His Cys Val Phe Val Asp Asn Gly Leu Leu Arg Tyr Lys			
260	265	270	
Glu Arg Glu Arg Val Met Glu Leu Phe Glu Lys Arg Leu His Leu Pro			
275	280	285	
Val Thr Cys Val Asp Ala Thr Glu Glu Phe Leu Ser Lys Leu Lys Gly			
290	295	300	
Val Thr Glu Pro Glu Met Lys Arg Lys Ile Ile Gly Lys Glu Phe Ile			
305	310	315	320
Asn Ile Phe Asp Leu Phe Ala His Asp Val Glu Glu Lys Val Gly Lys			
325	330	335	
Lys Pro Ser Tyr Leu Val Gln Gly Thr Leu Tyr Pro Asp Val Ile Glu			
340	345	350	
Ser Cys Pro Pro Pro Gly Ser Gly Arg Thr His Ser His Thr Ile Lys			
355	360	365	
Ser His His Asn Val Gly Gly Leu Pro Lys Asp Met Lys Leu Lys Leu			
370	375	380	
Ile Glu Pro Leu Lys Leu Leu Phe Lys Asp Glu Val Arg Glu Leu Gly			
385	390	395	400
Lys Ile Leu Asp Ile Ser Glu Asp Phe Leu Lys Arg His Pro Phe Pro			
405	410	415	
Gly Pro Gly Leu Ala Val Arg Ile Pro Gly Asp Val Thr Ala Gly Asn			
420	425	430	
Ser Leu Asp Ile Leu Arg Gln Val Asp Glu Ile Phe Ile Gln Ser Ile			
435	440	445	
Arg Asp Ala Lys Ile Tyr Asp Glu Ile Trp Gln Ala Phe Ala Val Phe			
450	455	460	
Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp Gln Arg Thr His Ser			
465	470	475	480
His Ala Val Ala Leu Arg Ala Val Thr Ser Gln Asp Gly Met Thr Ala			
485	490	495	
Asp Trp Tyr Tyr Phe Asp Phe Lys Phe Leu Asp Asp Val Ser Arg Lys			
500	505	510	
Ile Cys Asn Ser Val Arg Gly Val Asn Arg Val Leu Leu Asp Ile Thr			
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Ser Lys Pro Pro Ser Thr Ile Glu Trp Glu			
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<212> DNA

<213> Physcomitrella patens

<220>

<221> CDS

<222> (3)..(1148)

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Glu Asn Val Asp Ser Arg Ile Tyr Ala Leu Gln Tyr His Pro Glu Val		
25 30		
acg cac tca gag aaa ggg aca gag act ttg aga cac ttt ttc ctg aat		143
Thr His Ser Glu Lys Gly Thr Glu Thr Leu Arg His Phe Phe Leu Asn		
35 40 45		
gtc tgc ggc atg aag gct gac tgg cag atg cag aat gtg ttg gag gaa		191
Val Cys Gly Met Lys Ala Asp Trp Gln Met Gln Asn Val Leu Glu Glu		
50 55 60		
gag att aaa aag gtc act gcg acc gtc ggc cca gat gat cat gat gtt att		239
Glu Ile Lys Lys Val Thr Ala Thr Val Gly Pro Asp Asp His Val Ile		
65 70 75		
tgt gca ctc tcc ggg ggc gtg gac tca aca gta gca gct act ctg gtg		287
Cys Ala Leu Ser Gly Gly Val Asp Ser Thr Val Ala Ala Thr Leu Val		
80 85 90 95		
cac cgt gct att gga gat cgc ctt cat tgt gtg ttt gta gat aat ggc		335
His Arg Ala Ile Gly Asp Arg Leu His Cys Val Phe Val Asp Asn Gly		
100 105 110		
ctt tgc aga tac aag gaa aga gaa aga gta atg gcc aca ttt gtg aaa		383
Leu Cys Arg Tyr Lys Glu Arg Glu Arg Val Met Ala Thr Phe Val Lys		
115 120 125		
gac ctt cat ctg cca gtc act tgt gtg gat gcc act gag cag ttt ctc		431
Asp Leu His Leu Pro Val Thr Cys Val Asp Ala Thr Glu Gln Phe Leu		
130 135 140		
agc aaa ttg aag ggc gtg gta gat cca gag aga aag agg aag atc atc		479
Ser Lys Leu Lys Gly Val Val Asp Pro Glu Arg Lys Arg Lys Ile Ile		
145 150 155		
gga gca gag ttt att gca gtc ttt gat gaa ttt tcg cac aga ttg gag		527
Gly Ala Glu Phe Ile Ala Val Phe Asp Glu Phe Ser His Arg Leu Glu		
160 165 170 175		
aga gag att gga aag atg cct gct ttc ctt gtg cag gga aca ctt tat		575
Arg Glu Ile Gly Lys Met Pro Ala Phe Leu Val Gln Gly Thr Leu Tyr		
180 185 190		
cca gat gtc att gag tcg tgt cct cct cca ggg agc ggg aag tcg cat		623

Pro Asp Val Ile Glu Ser Cys Pro Pro Pro Gly Ser Gly Lys Ser His			
195	200	205	
tcc cac aca atc aaa agt cat cac aac gtc ggt ggc ttg ccc gag aac		671	
Ser His Thr Ile Lys Ser His His Asn Val Gly Gly Leu Pro Glu Asn			
210	215	220	
atg aaa ttg aag ttg gtt gag cct ctc aag tgg ctc ttc aaa gac gag		719	
Met Lys Leu Lys Leu Val Glu Pro Leu Lys Trp Leu Phe Lys Asp Glu			
225	230	235	
gtc cgc gaa atg ggt gca ttg ttg gat gta cct gtt tcc ttt ttg aag		767	
Val Arg Glu Met Gly Ala Leu Leu Asp Val Pro Val Ser Phe Leu Lys			
240	245	250	255
cgc cat cct ttc cct gga cct gga ttg gcc gtg cga att ctt ggg gat		815	
Arg His Pro Phe Pro Gly Pro Gly Leu Ala Val Arg Ile Leu Gly Asp			
260	265	270	
gta act cag gac ggc gca ctc gac act atc cgc ttg gtt gat gag atc		863	
Val Thr Gln Asp Gly Ala Leu Asp Thr Ile Arg Leu Val Asp Glu Ile			
275	280	285	
ttt gtg aac agc att cga gag gca ggt ctt tac gat aag atc tgg cag		911	
Phe Val Asn Ser Ile Arg Glu Ala Gly Leu Tyr Asp Lys Ile Trp Gln			
290	295	300	
gca ttt gct gtt tat ctg cca gta aag act gtt ggc gtt caa ggc gac		959	
Ala Phe Ala Val Tyr Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp			
305	310	315	
aaa cgg aca cat tca cac gct gtt gct cta cgt gca att aca agt gaa		1007	
Lys Arg Thr His Ser His Ala Val Ala Leu Arg Ala Ile Thr Ser Glu			
320	325	330	335
gac gga atg act gct gac tgg ttt cat ttt gat gga aag ttt ctt gcc		1055	
Asp Gly Met Thr Ala Asp Trp Phe His Phe Asp Gly Lys Phe Leu Ala			
340	345	350	
gag gta tca tct aaa atc tgc aac agc gta agg ggt atc aat agg gtg		1103	
Glu Val Ser Ser Lys Ile Cys Asn Ser Val Arg Gly Ile Asn Arg Val			
355	360	365	
gta tac gac att acg tct aaa cct cca tca act gtt gag tgg gaa		1148	
Val Tyr Asp Ile Thr Ser Lys Pro Pro Ser Thr Val Glu Trp Glu			
370	375	380	
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20 25 30
His Ser Glu Lys Gly Thr Glu Thr Leu Arg His Phe Phe Leu Asn Val
35 40 45
Cys Gly Met Lys Ala Asp Trp Gln Met Gln Asn Val Leu Glu Glu
50 55 60
Ile Lys Lys Val Thr Ala Thr Val Gly Pro Asp Asp His Val Ile Cys
65 70 75 80
Ala Leu Ser Gly Gly Val Asp Ser Thr Val Ala Ala Thr Leu Val His
85 90 95
Arg Ala Ile Gly Asp Arg Leu His Cys Val Phe Val Asp Asn Gly Leu
100 105 110
Cys Arg Tyr Lys Glu Arg Glu Arg Val Met Ala Thr Phe Val Lys Asp
115 120 125
Leu His Leu Pro Val Thr Cys Val Asp Ala Thr Glu Gln Phe Leu Ser
130 135 140
Lys Leu Lys Gly Val Val Asp Pro Glu Arg Lys Arg Lys Ile Ile Gly
145 150 155 160
Ala Glu Phe Ile Ala Val Phe Asp Glu Phe Ser His Arg Leu Glu Arg
165 170 175
Glu Ile Gly Lys Met Pro Ala Phe Leu Val Gln Gly Thr Leu Tyr Pro
180 185 190
Asp Val Ile Glu Ser Cys Pro Pro Pro Gly Ser Gly Lys Ser His Ser
195 200 205
His Thr Ile Lys Ser His His Asn Val Gly Gly Leu Pro Glu Asn Met
210 215 220
Lys Leu Lys Leu Val Glu Pro Leu Lys Trp Leu Phe Lys Asp Glu Val
225 230 235 240
Arg Glu Met Gly Ala Leu Leu Asp Val Pro Val Ser Phe Leu Lys Arg
245 250 255
His Pro Phe Pro Gly Pro Gly Leu Ala Val Arg Ile Leu Gly Asp Val
260 265 270
Thr Gln Asp Gly Ala Leu Asp Thr Ile Arg Leu Val Asp Glu Ile Phe
275 280 285
Val Asn Ser Ile Arg Glu Ala Gly Leu Tyr Asp Lys Ile Trp Gln Ala
290 295 300

Phe Ala Val Tyr Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp Lys
305 310 315 320

Arg Thr His Ser His Ala Val Ala Leu Arg Ala Ile Thr Ser Glu Asp
325 330 335

Gly Met Thr Ala Asp Trp Phe His Phe Asp Gly Lys Phe Leu Ala Glu
340 345 350 355

Val Ser Ser Lys Ile Cys Asn Ser Val Arg Gly Ile Asn Arg Val Val
355 360 365

Tyr Asp Ile Thr Ser Lys Pro Pro Ser Thr Val Glu Trp Glu
370 375 380